

### REMARKS

Claims 1, 3-7, 9-11 and 25-36 are pending in the subject application. Claims 1 and 5 are independent.

Claims 1, 3-7, 9-11 and 25-36 are presented for further prosecution on the merits.

#### A. Asserted Obviousness Rejection

In the outstanding Office Action Made Final, claims 1, 3-7, 9-11 and 25-36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2003/0057445 to Kweon et al. (“the Kweon et al. reference”).<sup>1</sup> Applicants respectfully traverse this rejection for at least the reasons set forth below.

##### 1. No *prima facie* case of obviousness has been established

Independent claims 1 and 5 each recite, *inter alia*, “the second metal layer is a nitride and aluminum layer.” Applicants respectfully submit that the Kweon et al. reference, whether alone or in combination with any other prior art of record, fails to disclose or suggest this aspect of claims 1 and 5. Accordingly, no *prima facie* case of obviousness has been established.

##### i. The mere disclosure of materials from among a broad genus is insufficient to establish obviousness

In rejecting claims 1 and 5, the Office action relies on a device illustrated in FIG. 1B of the Kweon et al. reference, but admits that the reference fails to identify the “second metal layer” described in connection with FIG. 1B as a nitride and aluminum layer.<sup>2, 3</sup> In an

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<sup>1</sup> In the rejection, U.S. Patent No. 6,521,494 to Matsui et al. (“the Matsui et al. reference”), is mentioned. It is apparent, however, that the mention of the Matsui et al. reference is an inadvertent error, which was carried over from the previous rejection based on the Matsui et al. reference (*Office action mailed July 11, 2007*).

<sup>2</sup> The “second metal layer” is interpreted in the Office action as corresponding to layer 24 in FIG. 1B of the Kweon et al. reference. In particular, the Office action interprets the claimed “diffusion barrier layer” as corresponding to layer 21 in FIG. 1B, and interprets the claimed “lower electrode” as corresponding to layers 23 and 24 therein. Further, the claimed “first metal layer having a cylindrical shape” is interpreted as corresponding to layer 23, and the claimed “second metal layer completely filling the cylindrical space” is interpreted as corresponding to layer 24.

attempt to overcome this deficiency, the Office action relies on a proposed combination of FIG. 1B with a device illustrated in FIG. 4E of the Kweon et al. reference, citing *KSR Int'l Co. v. Teleflex, Inc.* in support of the proposed combination of FIGS. 1B and 4E. However, even assuming, *arguendo*, that the device illustrated in FIG. 1B could be combined with the device illustrated in FIG. 4E, the combined devices would nonetheless fail to disclose or suggest each and every element of the claims.

In particular, the Office action identifies a sentence in the Kweon et al. reference listing 46 compounds that may be used to form each of a diffusion barrier layer, a bottom electrode, and a top electrode in the device of FIG. 4E, a listing that constitutes at least 97,336 permutations.<sup>4</sup> The Office action then asserts that it would be obvious to select only those materials that include aluminum and nitride for use as the "second metal layer."<sup>5</sup> Applicants respectfully submit, however, that the mere identification of the nitride and aluminum materials from among this broad disclosure of 97,336 permutations is legally insufficient to establish obviousness.

In particular, under *In re Baird*, the mere disclosure of a broad genus that encompasses a claimed compound is not sufficient to render the claimed compound obvious.<sup>6</sup>

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<sup>3</sup> Office Action Made Final mailed February 6, 2008, page 4.

<sup>4</sup> See the Office Action Made Final mailed February 6, 2008, which refers to paragraph [0055] of the Kweon et al. reference. Paragraph [0055] describes the following 46 compounds:

Pt, Ir, IrO<sub>x</sub>, Ru, RuO<sub>x</sub>, Rh, RhO<sub>x</sub>, Os, OsO<sub>x</sub> (x= 1~2), Pd, PdO<sub>x</sub> (x=1~2), CaRuO<sub>3</sub>, SrRuO<sub>3</sub>, BaRuO<sub>3</sub>, BaSrRuO<sub>3</sub>, CaIrO<sub>3</sub>, SrIrO<sub>3</sub>, BaIrO<sub>3</sub>, (La, Sr) CoO<sub>3</sub>, Cu, Al, Ta, Mo, W, Au, Ag, WSi<sub>2</sub>, TiSi<sub>2</sub>, MoSi<sub>x</sub> (x=0.3~2), CoSi<sub>x</sub> (x= 1~2), NbSi<sub>x</sub> (x=0.3~2), TaSi<sub>x</sub> (x=1~2), TiN, TaN, WN, TiSiN, TiAlN, TiBN, ZrSiN, ZrAlN, MoSiN, MoAlN, RuTiN, IrTiN, TaSiN, TaAlN and mixtures thereof.

Each of these 46 possible materials may be selected for any of the three layers (diffusion barrier layer bottom electrode, and top electrode). 46 x 46 x 46 = 97,336. Thus, there are least 97,336 possible combinations described as being usable for the three layers.

<sup>5</sup> The Office action interprets the "bottom electrode" referred to in paragraph [0055] of the Kweon et al. reference as corresponding to layer 24 in FIG. 1B therein, and thus corresponding to the "second metal layer" recited in claims 1 and 5.

<sup>6</sup> *In re Baird*, 16 F.3d 380, 382, 29 USPQ2d 1550, 1552 (Fed. Cir. 1994), which states, "[t]he fact that a claimed compound may be encompassed by a disclosed generic formula does not by itself render that compound obvious." See also M.P.E.P. § 2144.08(II), which states, "[t]he fact that a claimed species or

Thus, the use of a nitride and aluminum material for the second metal layer, as recited in claims 1 and 5, is not rendered obvious by the mere identification of a small subset of the 97,336 combinations described in the Kweon et al. reference.

ii. There is no teaching in the Kweon et al. reference that would lead one of ordinary skill in the art to select the claimed combination of materials from among the 2,116 permutations

The Office action asserts that it would be obvious to select a nitride and aluminum material for use as the second metal layer. The Office action, however, fails to set forth a proper rationale for selecting this particular material from among the thousands of permutations that are described in the Kweon et al. reference.

In particular, the only basis provided in the Office action for selecting the claimed material is *In re Leshin*, which is relied upon for the proposition that the selection of “a known material on the bas[is] of its suitability, for its intended use” is obvious.<sup>7</sup> However, *In re Leshin* is inapposite and does not support a finding of obviousness in this case.

In *In re Leshin*, the applicant sought to obtain a patent for the use of plastic in a molded tubular container, despite the fact that plastics were well known for such uses. The present case is in stark contrast to *In re Leshin*, as no corresponding teaching can be found in the prior art of record. In particular, the prior art of record fails to teach the “intended use” of preventing oxidation,<sup>8</sup> and fails to teach that the claimed aluminum and nitride material is “suitable” for that use. Thus, counter to the arguments raised in the Office action, the Kweon et al. reference, whether alone or in combination with any other prior art of record, fails to disclose or suggest the use of a nitride and aluminum material for the second metal layer

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subgenus is encompassed by a prior art genus is not sufficient by itself to establish a *prima facie* case of obviousness.”

<sup>7</sup> *In re Leshin*, 277 F.2d 197, 125 USPQ 416 (CCPA 1960).

<sup>8</sup> Claims 1 and 5 recite that the second metal layer “has a greater reactivity towards oxygen than the diffusion barrier layer.”

recited in claims 1 and 5. Accordingly, *In re Leshin* is not controlling.<sup>9</sup> Therefore, the Office action fails to establish a proper motivation for the selection of the claimed nitride and aluminum material for the second metal layer.

2. The claimed device yields surprising and unexpected results

As set forth above, applicants respectfully submit that no *prima facie* case of obviousness has been established. Moreover, applicants respectfully submit that the device recited in claims 1 and 5 yields surprising and unexpected results sufficient to overcome a *prima facie* case. Accordingly, applicants respectfully submit that the claimed device is not obvious.

Applicants note that, even where the prior art describes a genus of compounds, non-obviousness may be established with respect to a species within the described genus by demonstrating that the species provides surprising and unexpected results.<sup>10</sup> Further, applicants respectfully submit that evidence already of record in this case establishes such surprising and unexpected results.

In particular, the inferiority of devices which lack the nitride and aluminum second metal layer recited in claims 1 and 5 is demonstrated by FIG. 5 of the original application. FIG. 5 provides objective evidence that a device having a titanium nitride barrier layer, but lacking the nitride and aluminum layer recited in claims 1 and 5, exhibits volumetric expansion of the titanium nitride layer, which causes capacitors in the device to lean toward

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<sup>9</sup> See also *Sanofi-Synthelabo v. Apotex, Inc.*, 470 F.3d 1368 (Fed. Cir. 2006), which states that cases which found a particular species to be obvious based on a description of a broad genus were premised on a finding of a “pattern of preferences” that would direct one of ordinary skill in the art to select the particular species. Applicants respectfully submit that the Kweon et al. reference fails to provide any such “pattern of preferences” for selecting the nitride and aluminum material to use as the bottom electrode.

<sup>10</sup> See, e.g., *Eli Lilly v. Zenith Goldline Pharmaceuticals, Inc.*, 471 F.3d 1369 (Fed. Cir. 2006), in which the court indicated that secondary considerations of non-obviousness with respect to the claimed species olanzapine overcame any *prima facie* case of obviousness based on a prior art genus of thienobenzodiazapine compounds.

and contact adjacent capacitors.<sup>11, 12</sup> Moreover, nothing in the prior art of record suggests that the use of a nitride and aluminum as a second metal layer in a lower electrode would prevent the volumetric expansion seen in FIG. 5. Accordingly, applicants respectfully submit that the claimed devices result in surprising and unexpected results, as compared to devices lacking the claimed features, which further demonstrates the non-obviousness of the claimed subject matter.

In view of the above, applicants respectfully submit that the claimed subject matter would not have been obvious to one of ordinary skill in the art at the time the instant application was filed because the prior art of record fails to disclose or suggest a nitride and aluminum second metal layer. Moreover, the evidence of surprising and unexpected results afforded by the nitride and aluminum second metal layer further demonstrate the non-obviousness of the claimed subject matter. Accordingly, applicants respectfully submit that claims 1 and 5, as well as claims 3, 4, 6, 7, 9-11 and 25-36 depending therefrom, are allowable over the prior art of record. Therefore, applicants respectfully request that this rejection be favorably reconsidered and withdrawn.

#### B. Conclusion

The above remarks demonstrate the failings of the outstanding rejection, and are sufficient to overcome it. However, while these remarks may refer to particular claim elements, they are not intended to, nor need they, comprehensively address each and every reason for the patentability of the claimed subject matter over the applied art. Accordingly, applicants respectfully submit that the claims are allowable for reasons including, but not

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<sup>11</sup> Evidence set forth in the original application must be considered when assessing nonobviousness. See, e.g., M.P.E.P. § 716.01(a) and *In re Margolis*, 785 F.2d 1029, 228 USPQ 940 (Fed. Cir. 1986).

<sup>12</sup> See the original application at FIG. 5 and paragraphs [0012]-[0020] (herein, all references to paragraph numbers in the original application are made with respect to the published application, viz., U.S. Patent Application Publication No. 2004/0235260 A1).

limited to, those set forth above, and patentability of the claims does not depend solely on the particular claim elements discussed above.

The remaining documents cited by the Examiner were not relied on to reject the claims. Therefore, no comments concerning these documents are considered necessary at this time.


If the Examiner believes that additional discussions or information might advance the prosecution of the instant application, the Examiner is invited to contact the undersigned at the telephone number listed below to expedite resolution of any outstanding issues.

In view of the foregoing, reconsideration of this application is earnestly solicited, and an early and favorable further action upon all the claims is hereby requested.

Respectfully submitted,

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